

CLAIMS:

1. A method of forming a conductive adhesive connection comprising:

providing a first node;

providing a second node;

providing a liquid conductive epoxy between the first and second nodes, the liquid conductive epoxy having sufficient conductivity that a 15 mil length sample of the liquid conductive epoxy having cross-sectional dimensions of 50 mil by 2 mil would have a resistance of less than about 100 ohms along its length while having a viscosity of less than about 100,000 cps; and

curing the liquid conductive epoxy to form a conductive adhesive connection between the first node and the second node.

1 2. A method of forming a conductive adhesive connection
2 comprising:

3 providing a first node;

4 providing a second node;

5 providing a liquid conductive epoxy mixture between the first and
6 second nodes, the liquid conductive epoxy mixture comprising a first
7 liquid and a second liquid, the liquid conductive epoxy mixture having
8 sufficient conductivity that a 15 mil length sample of the liquid
9 conductive epoxy having cross-sectional dimensions of 50 mil by 2 mil
10 would have a resistance of less than about 100 ohms along its length
11 between about 10 minutes and about 20 minutes of combining the first
12 and second liquids; and

13 curing the liquid conductive epoxy to form a conductive adhesive
14 connection between the first node and the second node.
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1 3. A method of forming a conductive adhesive connection
2 comprising:

3 providing a first node;

4 providing a second node;

5 providing a liquid conductive epoxy mixture between the first and
6 second nodes, the liquid conductive epoxy mixture comprising a first
- liquid and a second liquid, the liquid conductive epoxy mixture having
8 sufficient conductivity that a 15 mil length sample of the liquid
9 conductive epoxy having cross-sectional dimensions of 50 mil by 2 mil
10 would have a resistance of less than about 100 ohms along its length
11 in less than or equal to about 30 minutes of combining the first and
12 second liquids; and

13 curing the liquid conductive epoxy to form a conductive adhesive
14 connection between the first node and the second node.
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1 4. A method of forming a conductive adhesive connection
2 comprising:

3 providing a first node;

4 providing a second node;

5 providing a liquid conductive epoxy mixture between the first and
6 second nodes, the liquid conductive epoxy mixture comprising a first
7 liquid and a second liquid, the first liquid comprising a hardener and
8 the second liquid comprising a base epoxy; the liquid conductive epoxy
9 mixture comprising at least one ionic salt, the mixture having a
10 sufficiently high ionic salt concentration that a 15 mil length sample of
11 the liquid conductive epoxy mixture having cross-sectional dimensions of
12 50 mil by 2 mil would have a resistance of less than about 100 ohms
13 along its length in less than or equal to about 30 minutes of combining
14 the first and second liquids; and

15 curing the liquid conductive epoxy to form a conductive adhesive
16 connection between the first node and the second node.

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18 5. The method of claim 4 wherein the liquid epoxy mixture is
19 formed by combining the first and second liquids with a third liquid,
20 the third liquid comprising the ionic salt.
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1 6. The method of claim 4 wherein the liquid epoxy mixture is
2 formed by combining the first and second liquids with a third liquid,
3 the third liquid comprising the ionic salt; and wherein the first, second
4 and third liquids are mixed prior to providing the liquid conductive
5 epoxy mixture between the first and second nodes.

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7 7. The method of claim 4 wherein the first and second liquids
8 are mixed prior to providing the liquid conductive epoxy mixture
9 between the first and second nodes.

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11 8. The method of claim 4 wherein the ionic salt is comprised
12 by the first liquid before combining the first and second liquids.

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14 9. The method of claim 4 wherein the ionic salt is comprised
15 by the second liquid before combining the first and second liquids.

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17 10. The method of claim 4 wherein the ionic salt is comprised
18 by the first and second liquids before combining the first and second
19 liquids.

1 11. The method of claim 4 wherein the ionic salt comprises a
2 lithium salt.

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4 12. The method of claim 4 wherein the ionic salt comprises a
5 lithium imide salt.
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1 13. A method of forming a conductive adhesive connection
2 comprising:

3 providing a first node;

4 providing a second node;

5 providing a liquid conductive epoxy mixture between the first and
6 second nodes, the liquid conductive epoxy mixture comprising a first
7 liquid and a second liquid, the first liquid comprising a hardener and
8 the second liquid comprising a base epoxy; the liquid conductive epoxy
9 mixture comprising at least one ionic salt; the ionic salt being present
10 in sufficient concentration that a 15 mil length sample of the liquid
11 conductive epoxy mixture having cross-sectional dimensions of 50 mil
12 by 2 mil would have a resistance of less than about 100 ohms along
13 its length in less than or equal to about 30 minutes of combining the
14 first and second liquids while having a viscosity of less than about
15 100,000 cps; and

16 curing the liquid conductive epoxy to form a conductive adhesive
17 connection between the first node and the second node.
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19 14. The method of claim 13 wherein the liquid epoxy mixture
20 is formed by combining the first and second liquids with a third liquid,
21 the third liquid comprising the ionic salt.
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1 15. The method of claim 13 wherein the liquid epoxy mixture
2 is formed by combining the first and second liquids with a third liquid,
3 the third liquid comprising the ionic salt; and wherein the first, second
4 and third liquids are mixed prior to providing the liquid conductive
5 epoxy mixture between the first and second nodes.

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7 16. The method of claim 13 wherein the first and second liquids
8 are mixed prior to providing the liquid conductive epoxy mixture
9 between the first and second nodes.

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11 17. The method of claim 13 wherein the ionic salt is comprised
12 by the first liquid before combining the first and second liquids.

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14 18. The method of claim 13 wherein the ionic salt is comprised
15 by the second liquid before combining the first and second liquids.

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17 19. The method of claim 13 wherein the ionic salt is comprised
18 by the first and second liquids before combining the first and second
19 liquids.
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1 20. The method of claim 13 wherein the ionic salt comprises
2 a lithium salt.

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4 21. The method of claim 13 wherein the ionic salt comprises
5 a lithium imide salt.

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7 22. A method of forming a conductive adhesive connection
8 comprising:

9 providing a first node;

10 providing a second node;

11 providing a liquid conductive epoxy mixture between the first and
12 second nodes, the liquid conductive epoxy mixture comprising a first
13 liquid and a second liquid, the first liquid comprising a hardener and
14 the second liquid comprising a base epoxy; the liquid conductive epoxy
15 mixture comprising at least one ionic salt; the ionic salt being present
16 in sufficient concentration that a 15 mil length sample of the liquid
17 conductive epoxy mixture having cross-sectional dimensions of 50 mil
18 by 2 mil would have a resistance of less than about 100 ohms along
19 its length while having a viscosity of less than about 100,000 cps; and

20 curing the liquid conductive epoxy to form a conductive adhesive
21 connection between the first node and the second node.

1 23. A method of forming a conductive adhesive connection
2 comprising:

3 providing a first node;

4 providing a second node;

5 providing a liquid conductive epoxy mixture between the first and
6 second nodes, the liquid conductive epoxy mixture comprising a first
7 liquid and a second liquid, the first liquid comprising a hardener and
8 the second liquid comprising a base epoxy; the liquid conductive epoxy
9 mixture comprising an ionic salt; and

10 curing the liquid conductive epoxy to form a conductive adhesive
11 connection between the first node and the second node.

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13 24. The method of claim 23 wherein the liquid epoxy mixture
14 is formed by combining the first and second liquids with a third liquid,
15 the third liquid comprising the ionic salt.

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17 25. The method of claim 24 wherein the ionic salt is completely
18 dissolved in the third liquid prior to combining the third liquid with the
19 first and second liquids.
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1 26. The method of claim 23 wherein the liquid epoxy mixture
2 is formed by combining the first and second liquids with a third liquid,
3 the third liquid comprising a thinner selected from the group consisting
4 of aliphatic glycidyl ethers and aromatic glycidyl ethers, the ionic salt
5 being a lithium salt present in the third liquid to a concentration of
6 from about 0.5 molar to about 1.2 molar prior to combining the third
- liquid with the first and second liquids.

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9 27. The method of claim 23 wherein the ionic salt comprises
10 a lithium imide salt.

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12 28. The method of claim 23 wherein the ionic salt comprises
13 one or more salts selected from the group consisting of LiAsF_6 and
14 $\text{LiN}(\text{CF}_3\text{SO}_2)_2$.

1 29. A method of forming a conductive adhesive connection
2 comprising:

3 providing a substrate, the substrate having a first node location
4 and a second node location, the first and second node locations being
5 joined by an electrical interconnect;

6 providing a first component having a first node;

7 providing a second component having a second node;

8 providing a liquid conductive epoxy between the first node and
9 the first node location, the liquid conductive epoxy comprising a first
10 liquid and a second liquid, the first liquid comprising a hardener and
11 the second liquid comprising a base epoxy; the liquid conductive epoxy
12 comprising a lithium salt;

13 providing the liquid conductive epoxy between the second node
14 and the second node location; and

15 curing the liquid conductive epoxy to form a circuit comprising the
16 first component electrically connected to the second component.
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1 30. A method of forming a circuit comprising:
2 providing a substrate, the substrate having a first node location
3 and a second node location, the first and second node locations being
4 joined by an electrical interconnect;
5 providing a first component, the first component having a first
6 node;
7 providing a second component, the second component having a
8 second node;
9 providing a liquid conductive epoxy between the first node and
10 the first node location, the liquid conductive epoxy having sufficient
11 conductivity that a 15 mil length sample of the liquid conductive epoxy
12 having cross-sectional dimensions of 50 mil by 2 mil would have a
13 resistance of less than about 100 ohms along its length while having a
14 viscosity of less than about 100,000 cps;
15 providing the liquid conductive epoxy between the second node
16 and the second node location; and
17 curing the liquid conductive epoxy to form a circuit comprising the
18 first component electrically connected to the second component.
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1 31. A method of forming a circuit comprising:
2 providing a substrate, the substrate having a first node location
3 and a second node location, the first and second node locations being
4 joined by an electrical interconnect;
5 providing a first component, the first component having a first
6 node;
7 providing a second component, the second component having a
8 second node;
9 providing a liquid conductive epoxy mixture between the first node
10 and the first node location, the liquid conductive epoxy mixture
11 comprising a first liquid and a second liquid, the first liquid comprising
12 a hardener and the second liquid comprising a base epoxy; the liquid
13 conductive epoxy mixture comprising at least one ionic salt, the mixture
14 having a sufficiently high ionic salt concentration that a 15 mil length
15 sample of the liquid conductive epoxy mixture having cross-sectional
16 dimensions of 50 mil by 2 mil would have a resistance of less than
17 about 100 ohms along its length in less than or equal to about 30
18 minutes of combining the first and second liquids;
19 providing the liquid conductive epoxy mixture between the second
20 node and the second node location; and
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1 curing the liquid conductive epoxy to form a circuit comprising the
2 first component electrically connected to the second component.

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4 32. The method of claim 31 wherein one of the first and
5 second components is a battery and the other of the first and second
6 components is an integrated chip.

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8 33. An epoxy comprising:

9 a liquid mixture of a hardener and a base epoxy; and

10 a concentration of an ionic salt within the liquid mixture, the
11 concentration of the ionic salt being high enough that a 15 mil length
12 sample of the liquid mixture having cross-sectional dimensions of 50 mil
13 by 2 mil would have a resistance of less than about 100 ohms along
14 its length in less than or equal to about 30 minutes of forming the
15 liquid mixture.

1 34. An epoxy comprising:
2 a liquid mixture of a hardener and a base epoxy; and
3 a concentration of ionic salt within the mixture, the concentration
4 of ionic salt being high enough that a 15 mil length sample of the
5 liquid mixture having cross-sectional dimensions of 50 mil by 2 mil and
6 a viscosity of less than 100,000 cps would have a resistance of less than
- about 100 ohms along its length.

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9 35. An epoxy comprising a lithium salt.

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11 36. The epoxy of claim 35 wherein a 15 mil length sample of
12 the epoxy having cross-sectional dimensions of 50 mil by 2 mil has a
13 resistance of less than about 100 ohms along its length.

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15 37. An epoxy comprising:
16 a liquid mixture of a hardener and a base epoxy; and
17 a concentration of a lithium salt within the liquid mixture.

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19 38. The epoxy of claim 37 wherein the lithium salt comprises
20 lithium imide salt.

1 39. The epoxy of claim 37 wherein the lithium salt comprises
2 one or more salts selected from the group consisting of LiAsF_6 and
3 $\text{LiN}(\text{CF}_3\text{SO}_2)_2$.

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5 40. An epoxy system comprising:
6 a first liquid comprising a hardener;
7 a second liquid comprising a base epoxy; and
8 a third liquid comprising a concentration of a lithium salt, the
9 first, second and third liquids being configured to be mixed together to
10 form a liquid epoxy which will cure to form a conductive adhesive
11 bond.

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13 41. The epoxy system of claim 40 wherein the lithium salt
14 comprises lithium imide salt.

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16 42. The epoxy system of claim 40 wherein the lithium salt
17 comprises one or more salts selected from the group consisting of
18 LiAsF_6 and $\text{LiN}(\text{CF}_3\text{SO}_2)_2$.

1 43. The epoxy system of claim 40 wherein the third liquid
2 comprises a thinner selected from the group consisting of aliphatic
3 glycidyl ethers and aromatic glycidyl ethers, the lithium salt being
4 present in the third liquid to a concentration of from about 0.5 molar
5 to about 1.2 molar.
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7 44. An epoxy comprising:

8 a liquid mixture of a hardener and a base epoxy; and

9 a concentration of ionic salt within the mixture, the concentration
10 of ionic salt being high enough that a 15 mil length sample of the
11 liquid mixture having cross-sectional dimensions of .50 mil by 2 mil and
12 a viscosity of less than 100,000 cps would have a resistance of less than
13 about 100 ohms along its length in less than or equal to about 30
14 minutes of forming the liquid mixture.
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